

June 28, 2018

Mr. Keiichi Ishii,
Minister of Land, Infrastructure, Transport and Tourism

Kazuhiro Nakahashi, Chairman,
Japan Transport Safety Board

On the opinion concerned with the Vehicle damage, railway serious incident
in Tokaido Shinkansen, West Japan Railway Co.Ltd.

Japan Transport Safety Board is investigating a serious incident (Dengerous trouble in vehicle) that occurred on December 11, 2017 in Tokaido Shinkansen involving a train belonging to West Japan Railway Company, and since the investigation to date has revealed useful information regarding the cracking of the bogie in order to prevent a recurrence, we have decided to report on the progress of this serious Incident investigation and make it public.

In view of the interim report, the JTSTB expresses its opinions to the Minister of Land, Infrastructure, Transport and Tourism pursuant to Article 28 of the Act for Establishment of the Japan Transport Safety Board as follows.

If any measures are taken in response to this opinion, please notify us of the details.

Notes

As it is likely that the contents of the works in the manufacturing stage of the bogie frame significantly related to the generation of the crack in the bogie in this serious incident, the items to be measured toward prevention of recurrence in every stage including the design, verification and the operating process, in addition to the manufacturing process of the bogie frame, based on the results obtained in the investigation and the analysis on the bogie frame up to the moment, were listed as follows.

The Minister of Land, Infrastructure, Transport and Tourism should implement the required measures for these items.

(1) Items related to the manufacturing

- (i) Implement the manufacturing management thoroughly, in order to ensure the manufacturing process not to reduce the strength of materials to secure the designed strength, in the stage of manufacturing bogie frames.
- (ii) Establish the system that can implement the following items certainly, as the system

in which only the sound products are supplied to the actual use.

- a. When the problems, such as the hindrance or the difficulties in the manufacturing process and the necessity to take measures accompanied with the machining of materials, occurred in the manufacturing site of the bogie frames, evaluate the probable effects to the safety of the bogie frame by the problems and the counter measures, as the measures of the organization.
- b. When the problems occurred in the manufacturing process or its counter measures are to affect the safety of the bogie frame, stop the work, investigate the causes back to the manufacturing process or the design stage and study the counter measures, then, resume the work after confirmed the validity of the results of the measures implemented.

(2) Items related to the design and verification

- (i) When implementing the strength analysis using computer by the FEM analysis in the strength design stage of the bogie frame as being applied the new structure, mind the importance to recreate the structural characteristics such as the plates with different rigidities were jointed locally, and the constraint condition for the place suspending the load weight as far as possible, and study to comprehend the trends of the place where large stress had generated considering the inherent property of the calculation errors in the FEM analysis from the results of the analysis, in order to comprehend the stress closer to the actual value.
- (ii) Even in the conventional bogie frame, if it is required, reconfirm whether the calculation model in the strength design recreated the structural characteristic that the plates with different rigidities were jointed locally and the constraint conditions as the place where suspending the load weight, etc., as far as possible, then, study again to comprehend the trends of the place where large stress had generated, after revised the calculation model.

(3) Items related to the inspections

- (i) Study to add the place to be inspected by the flaw detection, considering the safety ratio against the welded coupling, etc., based on the comprehension on the trends of the place where large stress had generated, for the flaw detection by the magnetic particle test or the penetrate test in the periodic inspection of the bogies.
- (ii) Study to implement the ultrasonic test, etc., in the proper frequency, for the place in the bogie frame where there was the trend to generate large stress in the area invisible from outside due to the other components, *i.e.*, area where the magnetic particle test and the penetrate test could not be applied, even when the expanded crack had bored through the material.

(4) Items related to the detection of the abnormal situation

Study the system to inform the abnormal situation to the train crews, etc., using effectively the data of the inner pressures of the air springs, etc., in order to detect the

abnormal situation such as the crack in the bogies in early stage properly and exactly.